

**City of Montrose
Manhole Lining Specification
For Severe H₂S Corrosion**

1.01 DESCRIPTION:

The work described within details a complete program for manhole lining and rehabilitation. This specification details the methods, procedures, materials and equipment required to produce "A Total Lining System for Manholes". The completed system will provide a corrosion resistant liner that restores walls to original surface levels and eliminates water infiltration and exfiltration.

1.02 REFERENCES:

- A. ASTM D7234 - Adhesion
- B. ASTM D412- Tensile Strength (PSI)
- C. ASTM D412- Elongation (%)
- D. ASTM D624- Tear Strength (PLI)
- E. ASTM D2240 - Hardness
- F. ASTM D522- Flexibility (1/8" mandrel)
- G. ASTM D4060- Taber Abrasion (mg loss)
- H. CIGMAT Evaluation (UH 96-7) of SpectraShield Liner System for Wastewater Concrete and Clay Brick Facilities. University of Houston Department of Civil Engineering: December 1996.
- I. CIGMAT Evaluation of the SpectraShield Liner System to 50 psi. November 2014.

1.03 SUBMITTALS

All materials and procedures required to establish compliance with the specifications shall be submitted to the owner/engineer for review/approval. Submittals shall include at least the following:

1. Technical Data Sheet on each product used.
2. Material Safety Data Sheet (MSDS) for each product used.
3. CIGMAT Evaluation.
4. Manufacturer's Certification of Applicator.
5. Certified Applicator Minimum Qualifications (Section 1.04 D).
6. Descriptive literature, bulletins and or catalogs of materials.
7. Work procedures including flow diversion plan, method of repair, etc.
8. Material and method for repair of leaks or cracks in the structure.
9. Statement of 10 Year Warranty.

1.04 QUALITY ASSURANCE

- A. The manufacturer and/or applicator (company performing the installation) of the total lining system for large wastewater structures shall be a company that specializes in the design, manufacture or installation of corrosion protection systems for wastewater structures. Applicator shall be completely trained in leak repair, surface preparation and corrosion

materials application. Corrosion materials/products shall be suitable for installation in a severe hydrogen sulfide environment without any deterioration to the liner.

B. The applicator shall be trained and certified by the manufacturer for the handling, mixing, application and inspection of the liner system as described herein.

C. To ensure total unit responsibility, all materials and installation thereof shall be furnished and coordinated by Manufacturer/Certified Applicator.

D. The applicator must be certified by the manufacturer and have successfully installed 5,000 square feet of SpectraShield in similar manhole environment. A documented installation history must be supplied to include; Owner Name, Contact Information, Project Description, Volume of Product Installed and Contract Duration.

PART II- PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. The materials to be utilized in the lining of wastewater structures shall be designed and manufactured to withstand the severe effects of hydrogen sulfide in a wastewater environment. Manufacturer of corrosion protection products shall have long proven experience in the production of the lining products utilized and shall have satisfactory installation record.

B. Equipment for installation of lining materials shall be high quality grade and be as recommended by the manufacturer.

C. The lining system to be utilized for large wastewater structures shall be a multi-component 'stress skin panel' liner system as described below:

1. Liner

<u>Installation</u>	<u>Liner</u>
Moisture barrier Surfacer	Polyurethane/Polymeric blend foam
Final corrosion barrier	Modified polymer (Silicone modified polyurea)

2. The Modified polymer (silicone modified polyurea) shall be sprayable, solvent free, two-component polymeric, moisture/chemical barrier specifically developed for the corrosive wastewater environment.

3. The Polyurethane Rigid Structure Foam, shall be low viscosity two-component, containing flame retardants.

4. Total thickness of multi-component liner system shall be a minimum of 500 mils.

D. The product shall be SPECTRASHIELD, manufactured by CCI Spectrum, Inc., or pre-approved equal.

PART III- EXECUTION

3.01 INITIAL INSPECTION

A. Applicator shall take appropriate action to comply with all local, state and federal regulations including those set forth by OSHA, EPA, the Owner and any other applicable authorities.

B. Prior to conducting any work, perform inspection of structure to determine need for protection against hazardous gases or oxygen depleted atmosphere and the need for flow control or flow diversion.

C. Submit plan for flow control or bypass to owner/engineer for approval prior to conducting the work.

D. New Portland cement structures shall have endured a minimum of 28 days since manufacture prior to commencing installation of the liner system.

3.02 SURFACE PREPARATION

A. Conduct surface preparation program to include monitoring of the atmosphere for hydrogen sulfide, methane, low oxygen or other gases, approved flow control equipment, and surface preparation equipment.

B. Surface preparation methods may include high pressure water cleaning, hydro blasting, abrasive blasting, grinding, or detergent water cleaning and shall be suited to provide a surface compatible for installation of the liner system.

C. Surface preparation method shall produce a cleaned, abraded and sound surface with no evidence of laitance, loose concrete, loose brick, loose mortar, contaminants or debris, and shall display a surface profile suitable for application of the liner system.

D. After completion of surface preparation, perform the seven point check list, inspecting for:

- | | |
|------------------|------------------------------------|
| 1. Leaks | 5. Ring and Cover condition |
| 2. Cracks | 6. Invert Condition |
| 3. Holes | 7. Inlet and Outlet Pipe Condition |
| 4. Exposed Rebar | |

E. After the defects in the structure are identified, repair all leaks and severe cracks with Spectra-Grout or pre-approved equal.

F. Upon completion of leak and crack repair, the surface shall be primed.

3.03 MATERIAL INSTALLATION

A. Application procedures shall conform to recommendations of the manufacturer, including material handling, mixing, environmental controls during application, safety and spray equipment.

B. Spray equipment shall be specifically designed to accurately ratio and apply the liner system.

C. Application of multi-component liner system shall be in strict accordance with manufacturer's recommendation. Final installation shall be a minimum of 500 mils. A permanent identification and date of work performed shall be affixed to the structure in a readily visible location.

D. A final written report shall be provided to the owner detailing the location, date of report, and description of the repairs.

3.04 FINAL INSPECTION

A. Final liner system shall be free of pinholes or voids. Liner thickness shall be the minimum value as described herein.

B. Visual inspection shall be made by the Owner. Any deficiencies in the finished liner system shall be marked and repaired according to the procedures set forth by the manufacturer.

C. The sewer system may be returned to full operational service as soon as the final inspection has taken place.

Part IV - WARRANTY

4.01 10-YEAR LIMITED WARRANTY

The manufacturer and Applicator shall warrant the liner against failure for a period of 10 years. "Failure" will be deemed to have occurred if the protective lining fails to (a) prevent the internal deterioration or corrosion of the structure (b) protect the substrate and the environment from contamination by effluent, or (c) prevent groundwater infiltration. If any such failure occurs within 10 years of initial completion of work on the structure, the damage will be repaired to restore the lining at no cost to the Owner within 60 days after written notification of the failure. "Failure" does not include damage resulting from mechanical or chemical abuse or act of God. Mechanical or chemical abuse means exposing the lined surfaces of the structure to any mechanical force or chemical substance not customarily present or used in connection with structures of the type involved. There are no additional warranties expressed or implied other than those specifically stated in this section 4.01 required.